

ACKNOWLEDGEMENTS

The writing of the history of the Office of Research and Development and the associated monographs were produced through the efforts of many of the members of the Office. We wish to express our appreciation to the individuals who have worked to produce this document; however, [redacted] [redacted] deserves special mention. Without [redacted] efforts and involvement in the coordination, preparation of graphs and charts, typing, and many other tasks that go into an endeavor of this kind, the ORD history would not have attained the level of quality nor would not have been completed in the time allocated.

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Editor
ORD History

PFIAB review completed.

FOREWORD

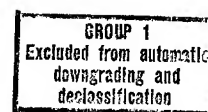
Research and development is a much used phrase in this modern age. The application of new technology can be viewed in every aspect of daily life. However, advancing technology has also made the security of the United States more difficult to maintain. The Intelligence Community must use every available means, including the use of the most sophisticated technological techniques, to collect and analyse information from which intelligence estimates can be made.

The Central Intelligence Agency must provide the leadership and direction for the exploitation of advanced technology for intelligence purposes. A major responsibility of the Office of Research and Development is to assure that CIA is in the forefront of technology.

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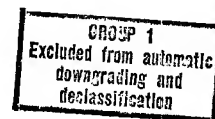
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SECRETOFFICE OF RESEARCH AND DEVELOPMENTI. Introduction

In the early 1960's it became apparent that a new Directorate would have to be added to the Central Intelligence Agency organization. This new Directorate would bring together those elements necessary to carry out intelligence collection by technical means. Because of the nature of evolving technology, it was no longer feasible to have the responsibility for technical collection systems and scientific intelligence production scattered throughout Agency components. The Director of Central Intelligence needed more direct management of these activities. Therefore, a Deputy Director for Research, Dr. Herbert Scoville, was appointed to organize and bring together the necessary resources to be responsive to the DCI's needs. Colonel Edward B. Giller, USAF, was appointed Assistant Deputy Director for Research. This new Directorate was initially composed of the Office of Special Activities (OSA), Office of Elint (OEL) and the Office of Research and Development (ORD).

II. Mission and Functions

The responsibility of ORD under the DD/R was to conduct in-depth research and development in the scientific and technical fields and to support intelligence collection by advanced technical means. The mission of ORD, as stated in DD/R 584-62 dated 26 September 1962, was as follows:

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[redacted] placed the responsibility on the Deputy Director (Research) to conduct in-depth research and development in the scientific and technical fields to support intelligence collection by advanced technical means. This was to be exclusive of those research and development activities to support agent operations, NPIC and the Office of Communications. In order to provide a capability to accomplish this mission, ORD has been formed in concept. While a preliminary Table of Organization and budget have been approved, the necessary manpower slots, funds and physical space have not been authorized.

"At present, the mission of ORD is conceived to be that of developing intelligence applications from technological discoveries, the operation of such applications and the conception of ways and methods by which operational analysis may maximize the effectiveness of such collection operations. In order to accomplish this, ORD will have three major divisions which are discussed below."

The three major divisions were Research Division, Systems Division, and Analysis Division. The intent was for the Research Division to perform the basic applied work on projects with the Systems Division mainly responsible for field engineering and applications of the systems. The role of the Analysis Division was to be the processing of data collected by the fielded systems. A secondary responsibility of the Analysis Division was to be the formulation of upgraded requirements levied on the Research and Systems Divisions to complete the cycle.

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By mid-1963 the ORD mission and functions were defined as follows:

Mission: To conceive and devise intelligence applications from scientific and technical advances and discoveries and to maintain and operate the capability for the collection and analysis of intelligence by the most advanced technical means. This is exclusive of those specific programs assigned to other Agency components.

Functions:

- a. To conduct the necessary basic and applied research and development in scientific and technical fields to support the collection of intelligence and its analysis;
- b. To develop techniques, procedures, equipment and/or systems utilizing the most advanced scientific discoveries for the collection of intelligence and its analysis;
- c. To systemize equipment and components for operational use and to operate and field the systems derived;
- d. To conceive the ways and means whereby such technical collection devices may be utilized;
- e. To conduct operational analysis whereby maximum effectiveness of collection operations may be achieved;
- f. To conduct liaison and such other activities as may be necessary for the fulfillment of its mission.

ORD's mission and functions have remained nearly the same since mid-1963; however, a quote from the Director of ORD's presentation to the

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Bureau of the Budget on 27 October 1967 gives a more concise statement of the mission and functions of ORD:

"The mission of the Office of Research and Development is to support and enhance the intelligence capability of the Agency by the prosecution of all appropriate basic and applied research and development, and in that connection let me state that the great majority of such R&D is applied; that is, it is problem oriented....."

III. Organization

In the original establishment of ORD, the Office was to be headed by an Assistant Director with three divisions reporting to him. This organizational structure is presented in Figure 1. Figures 2 through 9 show how the organization has evolved from its original inception to the present. The original concept for ORD was part of the concept of the Directorate of Research. The principal participants in the inception of ORD were Dr. Herbert Scoville, at that time head of the Office of Scientific Intelligence (OSI) and Colonel Edward B. Giller, Deputy Chief of Technical Services Division, DD/P.

The Office of Research and Development changed from its original structure (Figure 1) to that shown in Figure 9 to meet increased responsibilities. These responsibilities were part of the evolving technical collection effort with which the Agency was becoming more involved. These additional responsibilities necessitated the growth from a modest, small office to the larger, more diversified organization shown. New

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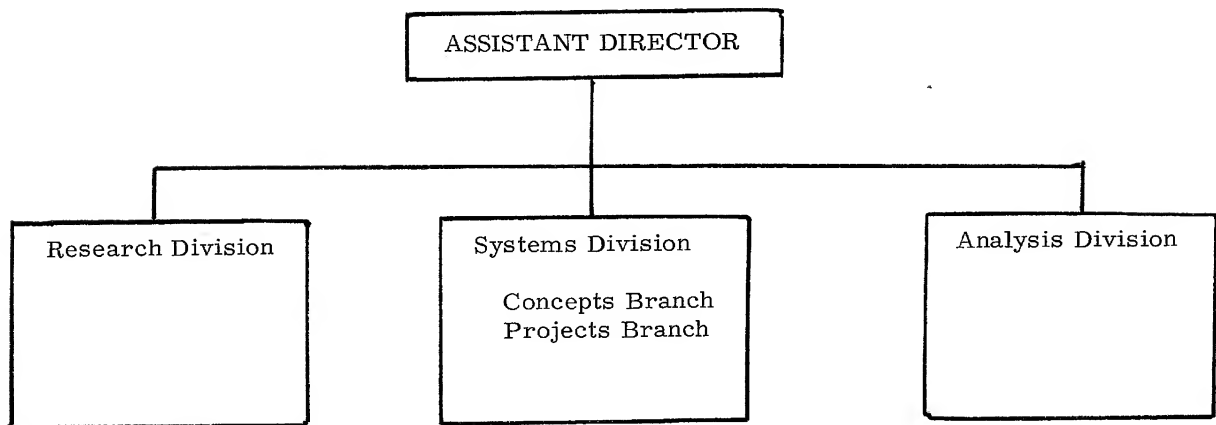


Figure 1. -- Original Concept

(per DD/R 584-62, 26 Sep 62)

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intelligence collection systems, as well as the pursuit of new technologies, made it mandatory that the Office recruit the most able people available within the U.S. scientific community. The Office of Research and Development was able to attract and hire very competent engineers and scientists. A review of the accomplishments of the Office substantiates this statement.

From the time ORD was originally formed, in early 1963, until October of that year, its administrative functions were handled by the administrative and logistics officers of the DD/S&T Staff. Increasing activities in this area led to the formation, on 3 September 1963, of an Administrative Office. In order to handle the growth in the financial area, especially that associated with outside contracts, a Budget and Fiscal Officer was added in March of 1964, thus transferring this function from the DD/S&T Staff to ORD. Special Assistants to the Director and Deputy Director were later added to carry out specific assignments. These are shown in the above-mentioned organizational charts.

As an appendix at the end of this chapter, Headquarters Notices relating to ORD have been included.

IV. Personnel

When the Office of Research and Development was originally established, it did not have a large on-board personnel pool from which to draw. This is in contrast to OSA and OEL whose staffing was accomplished through reassignment of on-board staff personnel. However, Col. Giller negotiated an agreement with TSD/DD/P by which he could offer positions in ORD to

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[REDACTED]

[REDACTED] These people were responsible for carrying forward certain projects transferred from TSD to ORD as well as initiating new projects in optics, electronics, physics, chemistry, and systems engineering. The second important responsibility of these people was to recruit personnel to staff this new office. Col. Giller was involved in recruiting a Director for ORD; in the interim he was appointed Acting Assistant Director and [REDACTED] served as Acting Deputy Assistant Director.

Mr. Robert M. Chapman, the future Director, entered on duty in August, 1963. He came to us from Geophysics Corporation of America where he had been Vice-President and Manager of their Viron Division. His background includes wide experience as a Physicist and as a scientific manager. He was named Deputy Assistant Director of ORD effective 9 September 1963; Acting Assistant Director on 4 May 1964; and became Director of Research and Development 27 July 1965.

[REDACTED] transferred from the Office of Scientific Intelligence in September, 1963, to become ORD's Deputy Assistant Director for Life Sciences. In OSI he had been Chief of the Life Sciences Division and is a recognized authority on Life Sciences on a National basis.

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25X1 [] was named Deputy Director of Research and Development at the time Mr. Chapman was designated as Director.

25X1 [] joined the Office as the Special Assistant to the Assistant Director of Research and Development in March, 1964. He had previously been a Planning Officer on the staff of the Director of Special Activities where he was responsible for reconnaissance program requirements, support and fiscal management. The transfer to ORD was to strengthen the staff in the areas of management coordination and administration during the early days of ORD growth. [] later became the Executive Officer of the Office with general responsibility for managerial support functions, for coordination of administrative planning and for inter- and intra-Agency liaison.

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25X1 [] joined the Office of Research and Development in November of 1964. His previous assignment had been Chief of the General Sciences Division of the Office of Scientific Intelligence. He was reassigned to ORD to provide guidance and assistance to the Director in the formulation, definition and execution of technical programs. This reassignment was largely determined on the basis of his past experience in the analysis and production of intelligence which would provide a suitable background to orient the technical project officers in ORD in performing their research and development activities. [] first served as Special Assistant to the Director of Research and Development and then, early in 1967, became Scientific Advisor to the Director.

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25X1 [] joined the Office of Research and Development in April, 1966. His previous assignment had been as Chief of the Physics and Electronics Branch, General Sciences Division of the Office of Scientific Intelligence. He was reassigned to the Office of Research and Development to provide program management guidance and assistance to the Director of ORD in the emplacement and staybehind equipment programs. This assignment was determined largely on the basis of his past experience in systems engineering research and development as well as the production of intelligence.

25X1 [] joined the Office of Research and Development in the Analysis Division on 10 April 1966. He was later reassigned to be the Technical Advisor to the Deputy Director of Research and Development in August, 1967, to have responsibility for ADP-associated problem areas. In addition, he also has prime responsibility for the planning, programming and budgeting functions of the Office.

25X1 When [] came to ORD, he brought with him [] 25X1
25X1 [] as his Special Assistant for liaison and administrative support.
25X1 [] acted in this capacity until his transfer in late 1965 to the Office of Planning, Programming and Budgeting.

25X1 [] entered on duty as Administrative Officer 25X1
on 3 September 1963. In March, 1964, [] transferred 25X1
from DD/P to become Budget & Fiscal Officer for ORD. []
was assigned to ORD from the Security Staff of DD/S&T in August, 1967,

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as security officer on a part-time basis; later in the year this became a full-time assignment.

When ORD moved from Headquarters [redacted] in March, 1966, it became necessary to increase the scope of operations of the Registry in order to comply with security regulations concerned with the handling of ORD correspondence. A vaulted area was specially constructed and the Registry was designated a control point for special channel documents. In April, 1966, [redacted] transferred from DD/S&T to become chief of the ORD Registry.

When the ORD Library was established in 1966, it was manned on a part-time basis by [redacted] of the Main Library. As utilization of the library facilities increased, [redacted] was added to the staff as the full-time Librarian.

In January and February, 1964, plans for establishing the ORD Career Service Panel were formulated. The first meeting was held on 9 March 1964 to discuss the organization and responsibilities of the Panel.

The voting members of the Panel were [redacted]

[redacted] The Chairman was [redacted] In 1966 the basic

structure of the Panel was altered in order to solve certain problem areas.

The chairmanship was changed, making it an elective position with a six-month tenure, the chairman to be elected by the Panel from its voting members. A later change placed [redacted] DD/ORD, as Chairman of the Panel and a permanent member.

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In addition to their normal duties associated with the Office of Research and Development, members of the staff have been involved in a number of "extracurricular" activities:

Mr. Robert M. Chapman was Chairman of the Photo Working Panel

25X1 [redacted] he was DD/S&T representative to the CIA R&D Review Board; he was named as the Agency focal point for R&D liaison with DIA; he is a member of the Technical Surveillance Countermeasures Committee of USIB and chairman of its Countermeasures Research and Development Subcommittee; and maintains close R&D liaison with DOD, DDR&E, Office of Science and Technology, and other Government agencies. 25X1

[redacted]

25X1 [redacted] is a member of the Suggestion Awards Committee (DD/S&T Representative); coordinator of the [redacted] CIA 25X1 Observer to the EXRAND Committee; guest speaker to the Office of Training IOC courses; and a member of the DD/S&T Requirements Committee.

25X1 [redacted] has maintained technical liaison with the Office of Science and Technology, DD/R&E, and other Government agencies. He is also a member of the DD/S&T Requirements Committee.

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[redacted] was the ORD representative to [redacted]

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[redacted] and is the coordinator of activities

associated with the President's Foreign Intelligence Advisory Board and a member of the ADP Security Panel.

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[redacted] has been effecting coordination in the areas of signal analysis with Office of Communications, Office of Elint, and FMSAC.

In summary, ORD has grown from its original staff of [redacted] in January, 1963, to [redacted] as of November, 1967. A listing of personnel and their assignments is shown on the organization charts, Figures 2 through 9. Figure 10 is a graph chart showing our growth from 1963 through 1967.

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IPRD

Established first secure R&D computer facility to apply new computer technology to attack the indigestion problem using:

On-line real-time display for analyst.

Computer controlled scanner of graphic data.

Time-shared retrieval system.

Ordering and structuring large data files.

High-speed machine recognition of keywords in audio tapes for intelligence search.

Noise-stripping from audio operational tapes to provide better intelligibility and intelligence output.

Method for analysis of business machine emanations for recognition of product of machine.

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DIRECTORATE OF SCIENCE AND TECHNOLOGY

GENERAL NOTICE NO. 12

5 May 1964

Mr. Robert M. Chapman is appointed Acting Assistant Director for Research and Development, effective 4 May 1964. Effective the same date, he will also serve as the Acting DD/S&T Representative to the Agency Research and Development Board.



ALBERT D. WHEELON
Deputy Director
for
Science and Technology

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ANALYSIS DIVISION

Chief -

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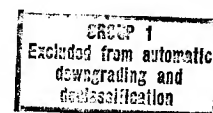
The Analysis Division is the most recently formed division within the Office of Research and Development. One of the prime considerations in its formation was that the advanced technical collection systems under development in many of the other ORD divisions would ultimately provide a large volume of highly technical raw data which must be processed and significant intelligence (e.g. signals, patterns, changes, etc.) extracted. It was apparent that for reasons of speed, accuracy, and efficiency such data processing would be performed in an automatic or semi-automatic way. Also, the Analysis Division would provide R&D support to a variety of consumers within the Agency in accordance with the general mission of ORD. Hence, the Analysis group was to be, and is, polarized about computers and computer-oriented processes.

The first professional employee of the Analysis Division, and its chief throughout its history, is EOD'd with the Agency on 28 June 1964, which can be taken as the formal inception of Analysis Division activities. has provided the planning and thrust of the Analysis Division program.

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By mid-1965 the "data indigestion" problem was becoming increasingly evident to key officials in the intelligence community. This problem can be summarized as follows: the volume of raw intelligence data inputs of various sorts (overt publications, CS reports, reconnaissance and other

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types of photography, waveform data, etc.) continues to increase. Intelligence analysis resources available, both manpower and money, are asymptotically approaching limits. Intelligence to be useful must be timely. Hence, automatic and semi-automatic procedures must be developed to aid the intelligence analyst in the performance of his duties. These considerations were emphasized in the recommendations of the PFIAB Communications Panel (memorandum from McGeorge Bundy to Director of Central Intelligence, 15 July 1965 - subject: U.S. Intelligence Community Capabilities for the Handling of Intelligence Information; USIB D-39.7/11). (Attachment #1)

The Division program has been responsive to the aforementioned challenges. Some general comments concerning program rationale are in order before the details of the program are reviewed. The basic goal of the program is to develop procedures and techniques which allow more intensive intelligence analysis, interpretation and production with greater speed and efficiency and with the use of less manpower. The underlying technical basis of the program is the rapidly developing state-of-the-art in computer technology and associated peripheral equipment. Increased computing and processing power, lower computing costs and increasing accessibility of machine capabilities for the intelligence analyst and user are available in the current technology and much more is to come. To achieve operational intelligence systems with the newly available technology requires intensive development effort concerned with machines, procedures

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and data characteristics as well as the requirements of the human analyst. Complex and difficult problems exist at the interfaces between these components. The Analysis Division program is focused largely on these interface problems.

Perhaps the most important aspect of the Analysis Division program to date has been the planning and implementation of the Intelligence Processing Research and Development facility (IPRD). The facility (initially called Intelligence Sciences Laboratory) was formally proposed in August, 1965 (Ref: ORD 2227-65, 11 August 1965, subject: ORD Intelligence Sciences Laboratory Facilities for Analysis Division Program, Attachment #2). The facility is designed to provide a focus for

the development of specialized procedures, equipment and techniques for intelligence processing;

the integration of components and procedures into operational subsystems;

testing of subsystems with real intelligence data; and

the generation of experience, know-how and technical specifications essential for planning and implementation of large operational systems.

Planning and design of the facility were completed in July, 1966, and appropriate approvals obtained to proceed with its implementation. Delivery of IPRD equipment commenced in late 1966. On 17 November 1966,

[redacted] was appointed Laboratory Director and [redacted]

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25X1 [] was appointed Assistant Laboratory Director. Further historical details concerning the IPRD are outlined in a separate monograph.

Initially, the Analysis Division program was divided into the technical areas as delineated in ORD 2227-65, Attachment #2. The program was later restructured in accordance with DD/S&T long range plans, and the end of FY 67 saw a further reorganization, with spheres of activity as outlined in Attachment #3.

FY 65 - The Analysis Division program in FY 65 was relatively modest, totaling [] Two externally supported projects, []

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[] were

concerned particularly with problems involved in extracting semantic information from natural language text and making this information amenable to analysts for storage and retrieval of facts. Two projects in pattern recognition were established. [] was concerned with the development of a man-machine system [] This effort was an outgrowth of work previously sponsored by TSD/DD/P.

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25X1 [] was concerned with surveying the whole field of pattern recognition with a view toward determining those developments which had particular application to Agency problems. [] was concerned

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with the development of devices for use by an analyst in an on-line mode of operation. In January, 1965, [] became the second

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professional employee of the Analysis Division. [] subsequently

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initiated and monitored work in speech processing research and development.

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FY 66 - The addition of [] to the Analysis Division

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professional staff occurred in FY 66. These included []

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[] who transferred from the Optics Division, ORD; []

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[] who transferred from OCR/DD/I;

(since

resigned), who transferred from NPIC/DD/I; and []

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(since resigned), an Agency career trainee. The FY 66 budget increased

to [] Speech processing research and development was

significantly expanded with the initiation of programs in speech intelligibility enhancement and key-word extraction from continuous speech.

The speech processing program is targeted against CS and FBIS requirements. Project action was begun in predictive analysis techniques and on-line processing design and programming. A major portion of Division

activity was directed toward the planning and design of the Intelligence

Processing R&D Facility. In addition, the following specific accomplishments can be reported:

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An extensive analysis was made of a FMSAC data base in order to determine the manner in which it could be in-put to a predictive modeling program (evolutionary programming).

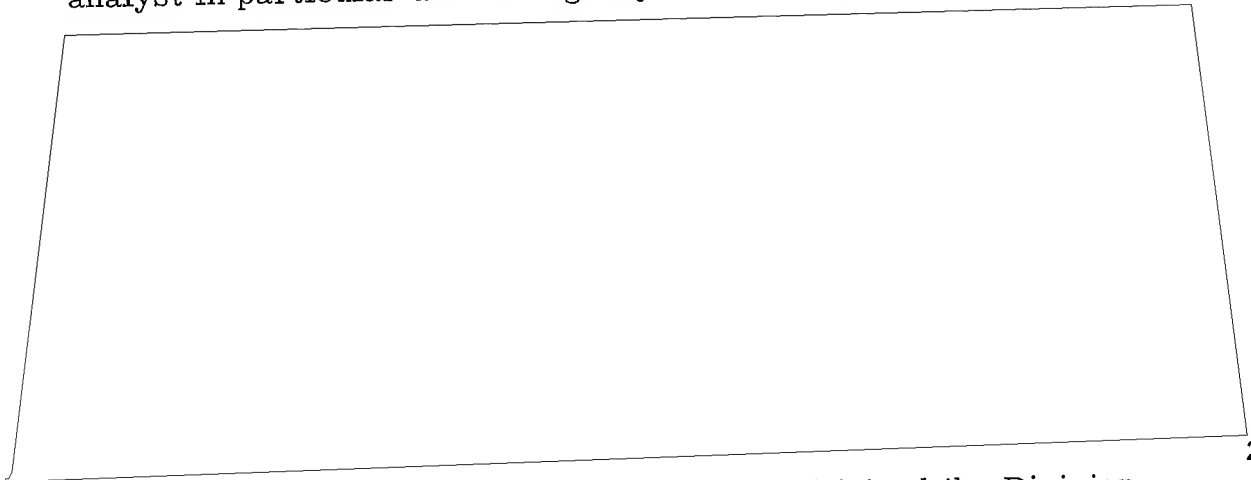
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A project involving the ORR/MD data base was initiated.

The project goal is to develop data processing tools to aid the ORR analyst in particular and the Agency analyst in general.

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FY 67 - During FY 67 the following personnel joined the Division

professional staff:



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who had previous Agency service at



NPIC,



who transferred from OCS/DDS&T. In addition, four OCS personnel,

headed by [redacted] were placed on full-time assignment to the IPRD.

The budget totaled [redacted] of which approximately one-third was

utilized for IPRD equipment purchases and rentals and the remainder for

external contract actions. During this period the bulk of the IPRD equip-

ment was installed and debugged. In-house work was begun on the

application of machine-assisted processes to problems of intelligence

interest. The following representative accomplishments can also be

listed:

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July 15, 1965

MEMORANDUM FOR THE DIRECTOR OF CENTRAL INTELLIGENCE

SUBJECT: U. S. Intelligence Community Capabilities
for the Handling of Intelligence Information

Enclosed herewith is a report and recommendations which the President's Foreign Intelligence Advisory Board submitted to the President under date of June 15, 1965.

The President has approved the three recommendations contained in the report.

It is requested that Recommendations 1 and 2 of the report be carried out by the intelligence community under your coordination, and that you submit to this office and to the President's Board by October 1, 1965 a progress report reflecting the actions taken.

With respect to Recommendation No. 3, this office will look to the President's Foreign Intelligence Advisory Board and the Special Assistant to the President for Science and Technology, for periodic reports concerning the activities of the Panel to be established pursuant to that recommendation. To assure proper linkage of the Panel with the broader interests of the Bureau of the Budget in automatic data-processing generally, it is suggested that the Director of the Bureau of the Budget designate a representative of the Bureau to maintain liaison with the Panel.

/s/ McGeorge Bundy

Enclosure

cc: The Secretary of State
The Secretary of Defense
The Director, Bureau of the Budget
The Special Assistant to the President
for Science and Technology
The Chairman, President's Foreign Intelligence
Advisory Board

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THE WHITE HOUSE
WASHINGTON

PRESIDENT'S FOREIGN INTELLIGENCE ADVISORY BOARD

June 15, 1965

MEMORANDUM FOR THE PRESIDENT

SUBJECT: U. S. Intelligence Community Capabilities
for the Handling of Intelligence Information

This report is based on a study made by the Communications Panel of the President's Foreign Intelligence Advisory Board. The study included consultations with knowledgeable representatives of the departments and agencies making up the U. S. intelligence community, and briefings supplied by the Committee on Documentation of the United States Intelligence Board (USIB) which, under the chairmanship of the Director of Central Intelligence, has been pursuing the current exercise known as SCIPS (Staff for Community Information Processing Study).

Our Panel's study leads us to the following conclusions and resultant recommendations for action in an area of U. S. intelligence activities which we consider to have a most important bearing on the national defense and security.

The principal objective of these recommendations is the prompt initiation by the U. S. intelligence community of positive steps toward the achievement of an improved capability for the efficient storage and retrieval of the intelligence product, through an appropriate combination of machine and human techniques for the management and control of the massive volume of intelligence information involved.

CONCLUSIONS:

1. Information-handling methods occupy a pervasive position in the whole administrative framework of the U. S. intelligence community. Present methods for handling the huge quantity of intelligence information, which is generated from day-to-day by a vast array of collection resources, are a determining factor in the effectiveness of our entire intelligence system to meet national security needs at policy and command levels of the Government.

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2. The systems problems involved are so massive and in many cases expensive, in both money and human resources, that many primary routines have often been rigidly embodied and retained. The systems problems of intelligence information access will continue to be of the most difficult type, heightening the importance of great improvements in the depth of understanding and of skills in tackling the wide variety of such problems which confront all levels of Government personnel concerned with access to the national intelligence base.

3. There is a necessary relationship of the United States Intelligence Board SCIPS study to the existing practices of information handling which are variously applied within the respective agencies engaged in the U. S. intelligence effort, particularly in regard to such matters as file format and file control methods. However, the present great demands for effective handling of information within the intelligence community require that additional actions go forward concurrently with those presently approved by the United States Intelligence Board.

4. The additional actions which are required provide the only foreseeable means of extending to the massive operations of the intelligence community the advantages of high-speed machine processing of both numerical and non-numerical information in a way which has already been applied in such specific areas of intelligence as cryptanalysis. Unless strong and immediate actions are undertaken in this area, there is danger that the efficiency of the production and dissemination of intelligence within the intelligence community will decline progressively, and that the already high costs involved will climb so steeply as to jeopardize national support of the broad intelligence effort.

5. Positive action is required now to supplement the longer-range Task Force projects being pursued by the United States Intelligence Board. A large share of the needed technical support will come from automatic data-processing machinery and methods, and from the resources of modern science and technology which are presently available to assist in meeting intelligence community needs for document handling all the way from initial production to final distribution. The need for new intelligence community actions for the handling and routine processing of intelligence information is not regarded as a direct consequence of the rise of the electronic computer. The need for such actions is more deeply the result of the growth of the intelligence community effort and the greater growth of the information which it must handle.

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The role of the computer is in offering a new way to assist in the reduction of greatly increasing problems in the intelligence field. The existence of these problems and the need to do things about them would have confronted the intelligence community in any event.

6. All the technical areas which must contribute to the problems of handling intelligence information are advancing very rapidly at present. The intelligence community, with its strong nucleus concerned with the use of computers in cryptanalytic and communications operations, has a real advantage in undertaking early and skillful planning in the information-handling area. (It would, however, be a mistake to assume that this experience can be easily applied to the use of computers in the handling of intelligence information.) The required planning and actions can be not only of great value to the intelligence community, but can be a broad and effective stimulus to improvement in other Federal Government computer operations whose importance is reflected in the President's recent message to the Congress on the use of automatic data-processing equipment.

7. The problems of the intelligence community in connection with information access and retrieval include, but are not restricted to, those common to all who must maintain very large bodies of information in accessible form. This is even true in the handling of information from unclassified sources. The importance of negative information, and of patterns of information, requires that access to intelligence information produce a completeness of response beyond that which is expected from many large files of stored information. Like statistics, intelligence cannot be satisfied with the highly anecdotal, but requires that all available items of information are allowed to contribute their part to the final summary or other intelligence product.

8. As a consequence of intelligence community requirements for high recall, the mechanized and automated means of access to many sorts of intelligence files cannot be required to meet simultaneously, rigid requirements as to relevance. Accordingly for some time to come the mode of gaining access to intelligence information will be through combined machine-human systems that will seek the machine retrieval of stored intelligence information in order that its relevance may be established by human examination. It is this combined machine-human factor which generates systems problems of great difficulty and dimensions.

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9. Ways and means must be sought by the intelligence community to enlarge the proficiency of personnel presently engaged in information-handling activities, either through (a) the retraining of personnel so engaged, or (b) the addition of new personnel having experience with systems work, preferably (but not necessarily) in the information sciences and technologies.

10. The scope of the intelligence community's problems in the information-handling field is such that it requires the guidance of a Panel of Technical Experts in the development of methods and facilities for information-handling and access.

11. In the area of experimental approaches to the adaptation of machine processing to the storage and retrieval of intelligence information, an encouraging beginning has been made within the National Security Agency where the Technical Information Processing System (TIPS) study is presently under way. This experiment, although on a limited scale and confined to a selected number of organizational units and information files within the National Security Agency, is producing important lessons for the achievement of a realistic system for the interrogation of a computer by remote users requiring access to a common information base.

RECOMMENDATIONS:

We recommend that the following actions be undertaken immediately within the intelligence community:

Recommendation No. 1: That selected personnel among the departments and agencies making up the U. S. intelligence community be provided specialized training and advanced studies at a university center or centers where systems thinking and systems skills are understood and imparted, and which at the same time possess adequate background in conventional bibliography and other more classical approaches to literature and information management.

An example of the type of specialized training center we have in mind is the Library School at the University of Chicago, headed by Dean Don W. Swanson. His background in mathematics and physical sciences, and his current emphasis on increased systems thinking in library education, accent the combination of educational capabilities and background which are considered necessary for purposes of meeting the objective of this recommendation.

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Arrangements involving this and perhaps other institutions might be made so that both senior administrative personnel and more junior operating people could acquire new abilities and attitudes which in the times ahead will be demanded in the discharging of responsibilities for the enormous file and distribution systems of the intelligence community.]

Recommendation No. 2: That the Technical Information Processing System (TIPS) project, now under way within the National Security Agency, be expanded to include participation by other member agencies of the intelligence community in an experimental operating system constituting a first step toward interagency (and interbuilding) information handling. Since results should be sought from the experiment as promptly as feasible, the participation of other agencies should be achieved by September of 1965; the capability for extensive handling of the Russian biography problem should be available in the community-wide system by the summer of 1966; and by the summer of 1967 it should be possible to exchange outputs from various mechanized sources in the fashion pioneered by the TIPS project.

[Only through such experimental operational trials can the intelligence community come to grips with the wide variety of program problems involved, including those of security compartmentation, the encryption of communications between the computer/information base and the user locations, and other problems. In order to make such a trial effective, it may be necessary to expand the scope of the information maintained in the TIPS system and, if so, this should be done with caution as to the total amount of material thus added. The intention should be to establish a system that will in fact be used by workers in at least a few agencies as a better way to meet day-to-day tasks; however, the system should be regarded as experimental and there should be no attempt to insure that in its experimental form its operation can be economically justified.]

Recommendation No. 3: That there be established a Panel, under the joint sponsorship of the Special Assistant to the President for Science and Technology and the President's Foreign Intelligence Advisory Board, having responsibility for: (a) providing guidance to the intelligence community in the forwarding of methods and facilities for information handling and access;

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(b) evaluating in technical terms the true meaning of the enormous and somewhat heterogeneous growth of the intelligence community's information pool.

[This recommended action is an urgent consequence of the USIB's Community Information Processing Study involving actions which, although helpful, are far from meeting the needs accented by the study. It is emphasized that the proposed panel of technical experts would not be tasked with the too obvious assignment of simply applying modern machine methods to the existing, specialized, and rigidly-maintained activities of processing and distributing information within the intelligence community. The panel would have the over-all task of guiding the necessarily large, and presently ignored, planning for the realistic and long-term development of mechanized facilities for the processing of information in the manifold forms in which it is encountered within the intelligence community. Thus, the composition of the panel and its individual skills should permit a concurrent approach to the overwhelming volumes of photographic, electrical and typographical material with which the intelligence system is presently flooded. It is noted that in such parts of the Government as the Bureau of the Budget, and in the Departments of State and Defense, attempts are being made to introduce automatic data-processing and information-handling systems into complex Government operations -- and the panel of technical experts could provide invaluable linkage among these detached efforts which now find some coherence only through the science and technical information people in the Office of Science and Technology and the Federal Council for Science and Technology. Finally, it is evident that the concept of the range of activities of the expert panel includes not only drawing on all the information-handling programs and activities in other parts of the Government, but also being available for over-all counsel in ways which might be especially useful to the Bureau of the Budget in understanding the role of mechanized information handling throughout the Executive Branch of the Government.]

For the Board

Clark M. Clifford
Clark M. Clifford
Chairman

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ORD-2227-65

11 August 1965

MEMORANDUM FOR: Director of Research and Development**SUBJECT: ORD Intelligence Sciences Laboratory
Facilities for Analysis Division Program**

1. We attach a summary of the principal elements of the proposed Analysis Division/ORD program which we have discussed in the last few weeks. We urge the adoption of the general plan of this program and the consideration of increased funding for FY66.

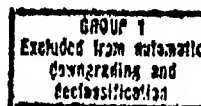
2. A new and important aspect of our program is concerned with the implementation of the analysis portion of an ORD Intelligence Sciences Laboratory to be set up in Headquarters Building. The tasks to be carried out by means of this facility, funding and manpower requirements, and additional background information are summarized in the attached material.

3. We suggest that the Analysis Division program, which has been in process of formulation for the past year, is a pertinent and important element to be included in a possible Agency response to questions raised by the recent PFIAB memorandum and studies of the NPIC operations.

Chief, Analysis
ORD/DD/S&T

Attachment:
An/ORD Summary Program

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Analysis Division/ORD

General Summary of Program Objectives

I. OPERATIONS AND SYSTEMS RESEARCH

Program Objectives:

To describe and update an integrated model of the overall intelligence process for purposes of management control and R&D planning.

To determine by a continuing study, the impact on the intelligence process of new advances in technology; e.g., mass memories, time-shared computers, multiple terminals, new recording, input, and display methods, new automated recognition methods, etc.

To design new intelligence processes and systems by the application of predictive analysis methods, statistical decision theory, mathematical modeling and operations analysis techniques.

II. RESEARCH AND DEVELOPMENT ON MAN-MACHINE PROCESSES

Program Objectives:

To design, develop and show feasibility of processes and equipment for support of human intelligence processing, interpretation, and production from textual, speech, graphic and waveform input data by application of available time-shared computer technology involving specialized remote terminals and displays.

III. RESEARCH AND DEVELOPMENT ON LANGUAGE AND TEXT PROCESSES

Program Objectives:

To design, develop, and show feasibility of processes and equipment for improved collection, interpretation, and

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production operations concerned with textual and language data. The R&D program shall include work on the following:

Textual Input and Transcription Processes
Representation and Indexing Processes
File Organization - Search - and Retrieval Processes
Automated Formatting, Summation, and Reporting
Logical Analysis and Automated Inference
Automated Classification
Machine-Aided Translation
Machine Translation

IV. RESEARCH AND DEVELOPMENT ON SPEECH PROCESSES

Program Objectives:

To design, develop, and show feasibility of processes and equipment for optimization of intelligibility of speech records, and for implementation of an audio pre-processing system with capabilities for automated phoneme, word and speaker recognition.

To design, develop, and show feasibility for operational use of a speech recognizer and phonetic typewriter for the continuous input of speech into data-processing systems.

V. RESEARCH AND DEVELOPMENT ON PATTERN RECOGNITION

Program Objectives:

To design, develop, and show feasibility for operational use of pattern recognition processes and equipment for intelligence interpretation and production operations.
The R&D program shall include work on:

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VI. RESEARCH AND DEVELOPMENT ON AUTOMATA, SELF-ORGANIZING AND ADAPTIVE PROCESSES

Program Objectives:

To design, develop, and show operational feasibility of processes and equipment which can sense, operate on and use intelligence data in remote and inaccessible locations and which function as automata, self-organizing processors, or processors which adapt to environment or to incoming sensory data.

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ORD/DD/S&T
Intelligence Sciences Laboratory - Analysis Program

SPECIFIC TASK AREAS

Laboratory facilities under this program are required for the development, testing, and evaluation of man-machine procedures, equipment, and subsystems in the following areas:

I. Documentary Analysis - Intelligence Production:

Processes which exploit the potential of on-line keyboards, displays, text analyzers, text recognizers, formatting, and editing routines, are to be developed and integrated to provide machine aids for the intelligence analyst.

II. Photo, Radar,

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Processes using computer-controlled graphic scanners at various levels of resolution, keyboards, input tablets with scribe input and control, mensuration equipment, visual, video, and CRT displays, are to be developed further and integrated into on-line operational subsystems for interpretation of photo, radar,

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III. Speech Processing:

Processes using converters, dynamic filtering, CRT displays, spectrum displays, voice control, audio output, pattern recognition processes, pitch tracking analysis, are to be developed and integrated into on-line operational subsystems for enhancing the intelligibility of speech in audio records, for optimizing speech signals in noisy records, for automated recognition methods for words, phonemes and speakers.

IV. Indexing, Search and Retrieval:

Processes using on-line keyboards, CRT displays, automated dictionary files, automated syntactic analyzers and parsers,

recent developments in logical representation, file organization, and search strategy are to be developed and integrated into an on-line indexing, search and retrieval subsystem for documentary intelligence data.

V. Text Processing:

Processes using keyboards, CRT displays, input tablets, and printers are to be developed and integrated into on-line subsystems for editing, formatting, correcting, composing, and report generating from textual input data.

VI. Signal Processing and Correlation:

Processes using converters, signal correlators, comparators, keyboards, CRT displays, transient and delay analyzers, sensor inputs, computer-controlled cameras, recorders, signal and pattern recognizers are to be further developed and integrated into an on-line subsystem for reduction, analysis, and interpretation of waveform and multisensor data.

VII. Pattern Recognition:

Processes using data input devices, keyboards, input tablets, computer-controlled scanners, converters, correlators, visual, video and CRT displays, pre-normalization, property classification and discriminant analysis methods, are to be further developed and integrated into subsystems for automated and human-monitored subsystems for recognition and interpretation of patterns of interest in graphic and waveform intelligence data.

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ORD/DD/S&T
Intelligence Sciences Laboratory - Analysis Program

Program Emphasis:

Emphasis is on exploitation of newly available computer technology with remote terminals, program-controlled devices and time-shared processors for intelligence analysis and interpretation.

Emphasis is on design and further development of basic man-machine functions in order to provide essential design and planning data for full systems implementation. Basic functions will be integrated into operational subsystems, tested, and demonstrated in order to show feasibility for application in Agency operations.

Why Action on this Program is Urgently Recommended Now:

1. New developments in man-machine technology can provide better tools to deal with the difficult problem of increased intelligence collection and limited man-power resources.
2. Major changes will be made in intelligence operations because of the impact of man-machine technology. Steps should be taken to lead in this period to the greatest extent possible.
3. There is danger that large systems applications will be attempted before the basic processes required in these systems have been sufficiently developed. This can be extremely costly and may actually impede desired progress.
4. There should be an adequate base of technical know-how and experience within the Agency in order to provide guidance for management and planning in a very complex and costly change-over period.

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5. The intelligence community has specialized requirements which are not being taken care of by developments for the military and for business applications. The Agency should take a lead in initiating appropriate R&D for its specialized needs and it should maintain a position in this area.
6. Recently certain scientific advisory groups, including the Communications Panel for the PFIAB, have urged that more positive action be taken in the man-machine area in the intelligence community. Studies of the NPIC operation urge action in the same direction. The program proposed for the Analysis Division/ORD has been formulated over the past year. The program demonstrates that the Agency has been resourceful and active in this important area; however, expansion and implementation of the program should now be carried forward.

ORD/DD/S&T
Intelligence Sciences Laboratory
Analysis Program

Facilities:

The following types of computer on-line devices and terminals are to be developed, improved, or evaluated in the analysis program:

- typewriters, keyboards, control consoles
- CRT displays with light pen input and control
- computer-controlled cameras, recorders, and video displays
- computer voice-controlled units and audio outputs
- computer-controlled graphic scanners
- input tablets with scribe input and control
- printers, plotters
- acoustic dynamic filtering equipment
- signal correlators, signal comparators
- spectrum display equipment
- A-D and D-A converters
- signal recognizers and transient analyzers
- various sensors and transducers
- pattern recognition and signature determination equipment
- character recognition equipment
- manual character reader unit
- dynamic and static wall display equipment for graphic and alphanumeric data

Central processor facilities will be provided with capacity to drive terminals and devices under development and with sufficient memory to permit testing and evaluation of experimental pre-operational systems.

Relation to OCS Facilities:

It will be a policy in the planning and implementation of this facility to establish linkages with the OCS facilities where this is feasible and desirable. Available OCS services are to be used particularly for input keying and processing of data and for programming tasks of common interest.

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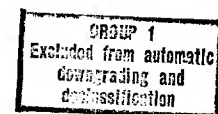
APPLIED PHYSICS DIVISION

Chief -



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SECRETAPPLIED PHYSICS DIVISIONI. Background

25X1 Programs in the Applied Physics (formerly Audio-Physics) Division
goal areas were initiated in FY 64 in primary response to the findings of
the CIA-DIA Scientific Guidance Panel established by NSAM-170 dated
October, 1962. [redacted] 25X1 who had extensive experience in
the [redacted]
needs of the Agency from both operational and R&D perspective, initiated
the first year's efforts for a broad investigation of parameters associated
25X1 with [redacted] technology. The initial efforts were begun in December,
25X1 1963, while [redacted] was Chief of the Radio Physics Division.

Applied Physics' mission is to form new concepts for technical
intelligence collection and countermeasures systems, identify R&D efforts
required to make or prove the new concepts feasible, and pursue such R&D 25X1
efforts necessary to achieve the desired capability and/or implementation 25X1
of the resulting advanced systems. [redacted]

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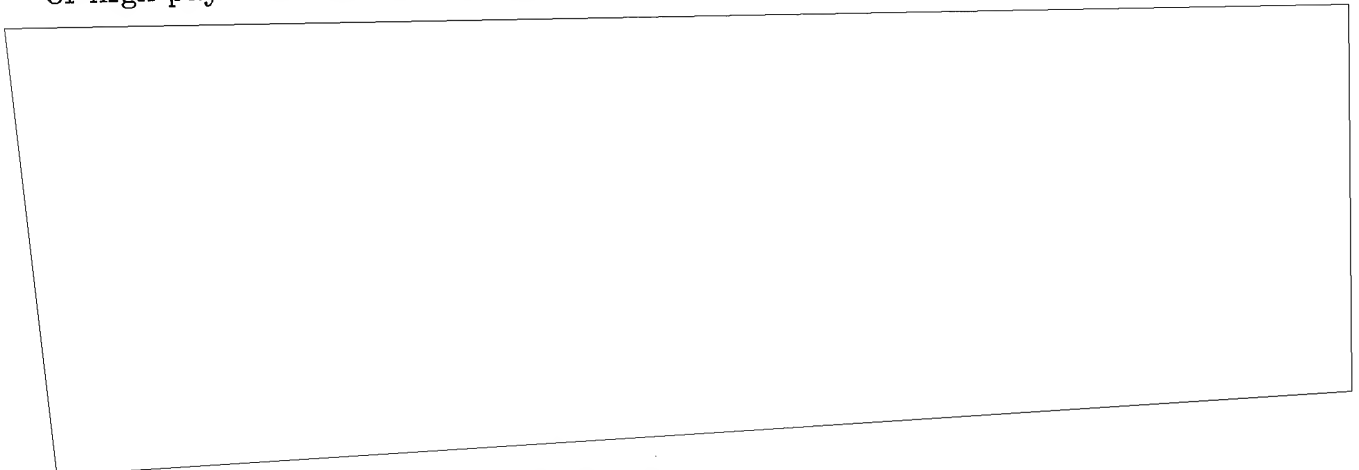
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25X1 The [] program was initiated in 1966 with [] as 25X1
project officer. In May, 1966, [] EOD'd and assumed 25X1
responsibility for the program. He, together with [] 25X1
(EOD 27 June 1966) formed the [] Branch, which 25X1
carries the primary responsibility for development of the [] 25X1
program. The program was advanced from feasibility studies to practical
R&D budget projects, many of which were initiated during the year.

During the latter part of 1966, the Audio Physics Division was
renamed Applied Physics to more accurately reflect the broad technological
programs now being pursued.

III. Philosophy

The Applied Physics Division has placed heavy emphasis on thorough
review of fundamental principles and state-of-the-art technology which
could be integrated into an overall system approach for the solution of AS
and ASCM problems. The fundamental studies resulted in a better under-
standing of principles which could be further researched to produce results
in the same areas plagued by a series of failures in the past. Examples
of high pay-off achieved through using this approach are: 25X1

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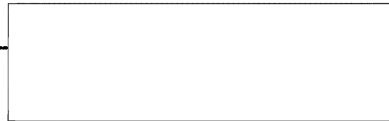
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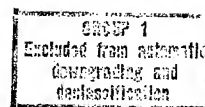
BIOLOGICAL SCIENCES DIVISION

Chief -



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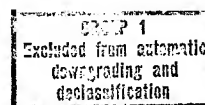


SECRETBIOLOGICAL SCIENCES DIVISION

In 1963, during the early formative phases of the Office of Research and Development, Office efforts were roughly divided into Life Sciences and Physical Sciences. At that time no divisional organization existed. This situation was extant, insofar as Life Sciences were concerned, until June, 1965.

Life Sciences efforts were dichotomous -- first, to carry out required research and development efforts, and second, to carry on a continuing program of educating various Agency components in the ways in which Life Sciences could be used to exploit the vast potentials of the "living world" as a complement to Physical Sciences in the technical aspects of intelligence collection. The Life Sciences mission as promulgated at that time was stated, "to undertake R&D in the Life Sciences which will assist the Agency in the collection, collation, analysis and dissemination of intelligence; to undertake promising research in support of other offices of the Agency where adequate research capabilities were nonexistent, with particular emphasis on efforts which might be applicable to the problems of several Agency components, e. g., measurement of physiological and psychological stress".

The initial Life Sciences organization consisted of a Technical Manager reporting directly to the Assistant Director and Deputy Assistant Director of ORD. The position of Technical Manager was occupied by

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[redacted] from the inception of ORD until June, 1965. During this period, the Life Sciences area grew to a working group of [redacted] technical officers and support personnel.

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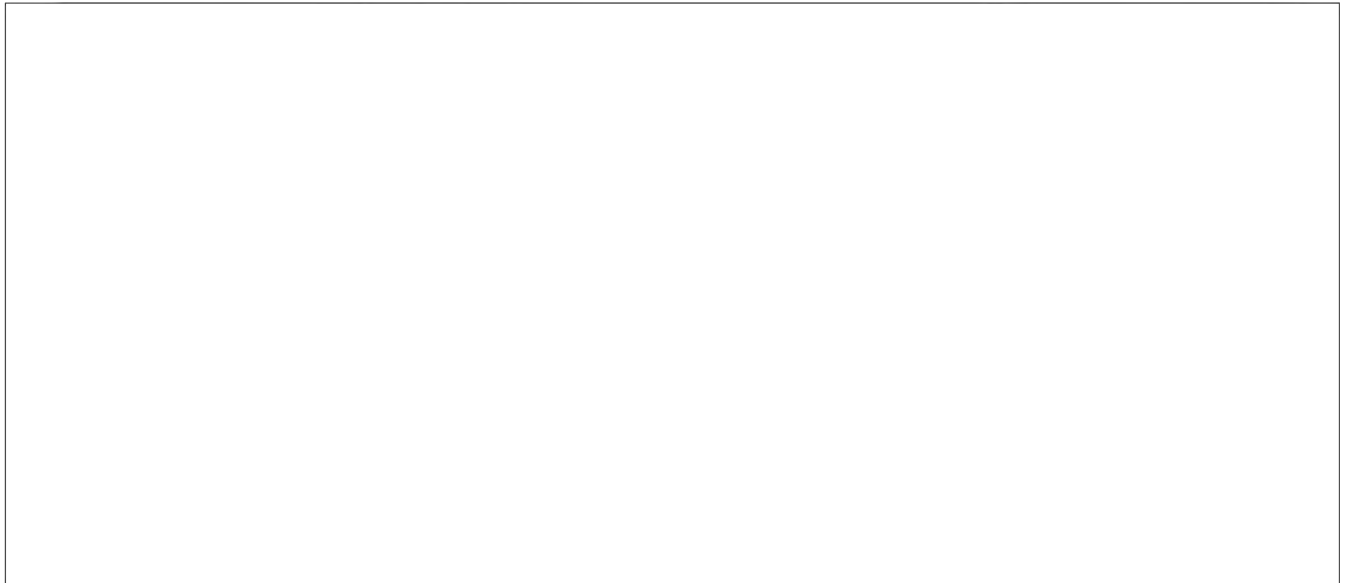
During this period a number of accomplishment milestones were achieved, as detailed in Appendix A. Major milestones are related directly to missions and requirements; minor milestones were achieved in support of other Agency/Federal components.

In June, 1965, the Life Sciences program was reorganized as a result of a more clearly defined set of missions and requirements and to facilitate support in terms of management and coordination. Also, it was apparent that the Technical Manager was no longer able to maintain an adequate and

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efficient overview of the total Life Sciences program because of its size, diversity and complexity. Accordingly, the position of Technical Manager was abolished and two line organization divisions were established. Schism of personnel and program followed essentially disciplinary lines. These two divisions were titled Biological Sciences Division, under the direction of [REDACTED] and Medical and Behavioral Sciences Division, under the direction of [REDACTED] (a career Medical Staff employee).



As a consequence of the breadth of the programs falling under the generic heading of Biological Science, the limited number of biological scientists within the Agency, and the interface of these projects with related work in other Government agencies, there has been considerable inter-agency interaction. An outline of these coordinated activities is presented in Table I.

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The Biological Sciences Division at the present time has personnel, with an anticipated growth by FY 1970. Its current budget is twice the initial total budget of Life Sciences, for an integrated growth rate of approximately per year. It is anticipated that by FY 1970, another increase increment will be realized. Table II indicates the fiscal growth of the Division.

TABLE IIFiscal Growth

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The personnel roster of the Division now includes the following:

Accomplishments listed in Appendix B are grouped by study areas and are in addition to the previously listed milestones.

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Overhead Crop Photography

Film/filter combination for the detection of low vigor (disease, mineral deficiency, mineral toxicity, physical damage, etc.) in rice, wheat, and sugar cane has been established.

Low vigor signatures can be detected on multispectral photography taken at 20,000 feet and on simulated multispectral photography up to 300,000 feet (approximate orbital altitudes).

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Data reduction techniques have been proposed and implemented.

Preliminary PI keys for accurate yield estimations have been formulated. Yield estimates from these keys have permitted estimates with little or no ground truths to of the actual yield data.

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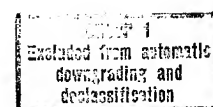
OPTICS DIVISION

Chief -

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SECRETOPTICS DIVISIONA. Introduction

Activity in the Optics area was initiated prior to the formalization of the Office of Research and Development. This occurred due to the request of General (then Colonel) Edward B. Giller, Assistant Deputy Director (Research), that [] of TSD/DD/P investigate

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the state of technology of infrared scanning systems and prepare recommendations for research and development in this field. This work was

initiated in October, 1962, approximately three months before [] the second scientific member of ORD, reported for duty with ORD/DD/R; the first member, [] preceded him by several days.

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The more formalized shape of an organization did not begin to form until Mr. Robert M. Chapman and [] reported aboard as

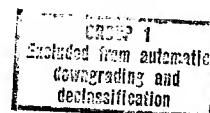
the Assistant Director and Deputy Assistant Director, respectively. At this point, [] was designated Chief of the Optics Division, with []

staff members, []

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From the initial concept, the mission of ORD was to provide research and development capability in technical and scientific fields, and to intelligence requirements in general. In the optics area it was specifically directed to optical collection devices and ancillary activities, and to direct support to the Office of Special Activities in research and development of advanced overhead collection systems. For the most part, Optics Division has adhered to its original mission.

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There are other achievements, and some failures, in the Optics Division program. Failures for the most part resulted from trying to achieve goals where it was not possible to push the state of technology within the time limitations set to achieve the goal. However, successes far outnumber the failures, and the Optics Division enjoys a good reputation for being conceptual and getting things done.

C. Philosophy

For the most part Optics Division has been engaged in applied research and development, even though it has established the state-of-the-art in infrared and magnetic detection. With the establishment of the Optical Sciences Laboratory in Optics Division, the trend is toward in-house analysis of optical phenomena prior to external contracting for optical manipulations.

One of the questions posed to Optics Division is "How do you accomplish your developments so rapidly?" The technique is to do total contracting for all phases, the philosophy being that at some point in a

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phase prior to phase completion there is sufficient data to render a decision to go ahead. If the decision is made at that time to proceed with the next phase, six months to a year can be saved, depending on the complexity of the system under development. Also, the philosophy is to design for an operational prototype, which means that the first model is designed to be used operationally, if necessary. There is a large risk factor involved, but if the project engineer is sufficiently knowledgeable and is close to the development, the risk is not as great as it appears to be.

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D. Problems

The major problem facing Optics Division is the top level decision that large reconnaissance systems will not be undertaken. This reverses, somewhat, the original mission of the Optics Division, and at present Optics is restructuring its roles and mission. Funding is a problem, and the tendency is to fund those R&D projects which have the least amount of risk. While this is understandable in the light of tight money, it does stifle bold approaches toward solution of problems. Certainly fewer state-of-the-art systems will be developed if this tendency continues.

In the final analysis, however, there are not as many restrictions placed on the technical people when compared to those of the military. Although there are frustrations, the work is most challenging, diversified, and most enjoyable.

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